Capacity development and skills retention through a workplace placement programme in the foundry industry: the MCTS experience

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The South African foundry industry has an ageing workforce, and reports indicate a lack of skills in the full value chain. The University of Johannesburg Metal Casting Technology Station (UJ-MCTS), through the initiative from the Technology Innovation Agency funded by the Department of Science and Technology, has introduced a workplace placement programme that is aimed at placing students in industry for one year to gain foundry work experience and professional skills before graduating, with stipend paid and provided by UJ-MCTS. This paper reports on the UJ-MCTS experience. Secondary data (minutes from meetings, e-mails, project reports) as well as the authors' direct experience (as first- hand information and collected data, archived as the UJ-MCTS internship programme database pre and post the internships) in the programme were used as research instruments, while observations at the end were used for the triangulation. The UJ-MCTS placed a total of 96 students in industry from 2009 to 2015, with an overall 60% being retained as employees after completing their one-year placement. The benefits gained by students and industry include working experience, graduation of the students, talent identification, and employment of the student to ameliorate some of the skill shortage. The study shows that through this workplace placement programme, the industry and students are in a win-win situation.

Keywords: workplace placement programme, students, foundry industry, Metal Casting Technology Station

INTRODUCTION

The Department of Public Enterprises introduced a Competitive Supplier Development Programme (CSDP) with the aim of increasing the competitiveness, capacity, and capability of the local supply base. This in turn will further the long-term commercial interests of state-owned enterprises (SOEs) by (1) improving the competitiveness of the services provided by SOEs, (2) increasing the security of supply for SOEs, and (3) providing the potential advantages of local supply as opposed to imports (DPE, 2007).

Improving the capacity and competitiveness of the local supply base will also contribute to the Accelerated and Shared Growth Initiative of South Africa (ASGISA) goals of shared growth, employment creation, poverty reduction, skills development, and Broad-Based Black Economic Empowerment (BBBEE) (DPE, 2007).

In 2008 the Department of Science and Technology (DST) released a Technology Localization Plan which identified foundries as key role-players in the large-scale infrastructure recapitalization and expansion programmes for major SOEs over the next 20 years and beyond. Expenditure is estimated in the region of R1.3 trillion up until 2025 by Eskom, and at least R76 billion by Transnet (DST, 2008). It is therefore clear that localization of supplies to the major SOEs presents a massive economic opportunity for the South African manufacturing and related industries (DST, 2008).

However, in many categories of procurement, local industries lack the required competitiveness to enter the supply chains of the SOEs. These deficiencies include inflexibility and lack of innovative capability to exploit high-value-add opportunities, the shortage of relevant technical skills, and inadequacies in the skills delivery system (DST, 2008).

The foundry roadmap report noted that a shortage of technical skills has adversely affected the competiveness of the foundry sector (Viljoen, 2005). The challenge of the skills shortage was also confirmed by the Rapid Appraisal of Local Innovation System (RALIS) exercise carried out by the University of Johannesburg (Stamer, 2008) and by the benchmarking studies carried out by the by National Foundry Technology Network (NFTN) in 2009 (CastingsSa, 2010, p. 10).

The shortage of technical skills in the engineering field has been a national challenge, with Government taking the initiative to address the skills gap through the Skills Development Act (SDA, 2008). The survey suggests that 70% of South African foundry workers have never gone to school or have only basic education; only 25% (usually the supervisors) have a school-leaving certificate; and only 5% are university graduates (CastingsSa, 2016).

The RALIS exercise indicated that the foundry industry suffers from a serious shortages of technical skills; the main reason for this being insufficient investment in attracting and training new talent. This has left the industry with an ageing workforce with minimal new talent entering (Stamer, 2008).

In 2009 the University of Johannesburg Metal Casting Technology Station (UJ-MCTS) undertook an initiative to facilitate skills development training in the foundry industry. This was designed as an internship programme focused mainly on equipping university students with workplace experience. The programme was sponsored by the DST and managed by the Technology Innovation Agency (TIA) under the Technology Station Programme (TSP). Turner (2013) stated that spending a year working in industry and putting theory into practice before completing the final year of their degree prepares students for the workplace and can provide huge benefits to both students and businesses.

The UJ-MCTS strategy in the workplace placement programme was focused mainly on attracting young talent into the foundry industry to increase throughput and capacity within the sector and to address the skills shortage and ageing workforce profile. In addition, the programme was aimed at supporting industry with transformation and talent retention. This is in line with national government priorities of assisting companies to employ well-educated young professionals. When these are from previously disadvantage groups, it allows the companies to meet employment equity targets (Musingwini, 2012).

The paper discusses the experience by UJ-MCTS over 7 years of student workplace placement, with the purpose of sharing the knowledge gained and describing strategies used to implement a skills development programme in collaboration with the foundry industry.

OVERVIEW OF THE WORK PLACEMENT PROCESS

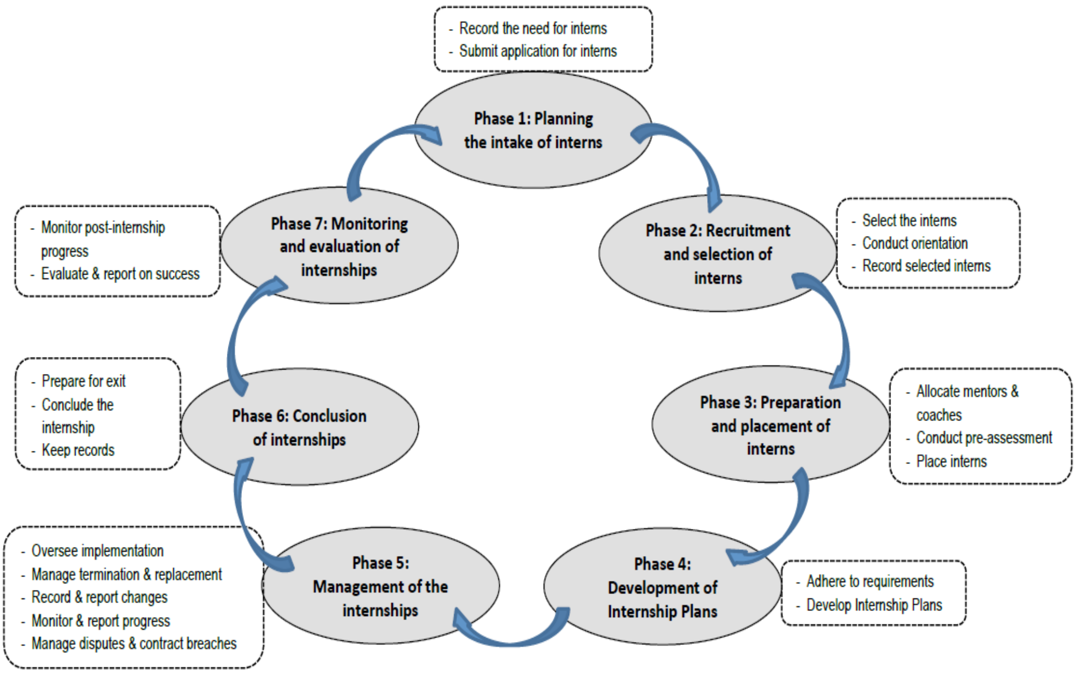

Figure 1. Process flow of work placement process (TSP, 2014).

As seen in Figure 1, the work placement process consists of seven phases constituting a consolidated effort between industry and the university to ensure the expectations of the industry are met.

Phase 1 is planning of the intake process. This process consists of engagement with the foundry industry on how many students will be required and how many foundries are willing to participate in the upcoming financial year. The information is captured and consolidated into the UJ-MCTS annual operational plan and submitted for approval.

After approval, the UJ-MCTS starts with the recruitment and selection process. The recruitment process focuses on shortlisting and interviewing prioritized focused groups of previously disadvantage individuals, who are academically deserving and have completed all necessary final-year modules. This starts with advertising the programme by word of mouth or internal social media such as Facebook to encourage suitable candidates to apply for the programme.

Phase 3 involves preparation and placement of the students. During this stage each student is introduced to a foundry and allocated a mentor who is an industrial supervisor in that foundry. The mentor conducts a pre-assessment of the learning needs of the student together with the UJ-MCTS staff member to ensure that academic requirements for the student are met as per the UJ Engineering integrated learning guideline for metallurgy work.

In phase 4, the mentor and student develop an internship plan in accordance with the guideline, which includes Practical Training 1 (P1) and Practical Training 2 (P2). P1 includes induction into the organization, general safety on the plant, and familiarization with laboratory equipment, sampling procedures, and conducting of tests. The student is also required to have an understanding of the basic operation of the plant. P1 takes place over 6 months. P2 require students to undertake basic industrial projects, which include problem solving and experimentation which provide hands-on experience.

Phase 5 is management of the internship. At this stage the student and the mentor meet frequently to evaluate the progress of the training and complete the logbook based on the activities completed on the plan. The UJ-MCTS staff member monitors the students by a visit the foundry once and requesting submission of progress reports, which are approved and signed off by the mentors, every 6 months.

Phase 6 concludes the internship. The student submits the P2 report to the Department of Engineering Metallurgy. In the report, the student has to demonstrate that he/she has developed technical competency in applying foundry technology principles in the project. The student is assessed in accordance to the guideline, norms, ethics, and criteria laid down by the university for completion of the National Diploma in Engineering Metallurgy. After submission of the report the student prepares to exit the program.

Phase 7 is monitoring and evaluation of the internship. After the student had exited the programme, the UJ-MCTS staff member follows up with the student or mentor on the status of employment. The UJ-MCTS compiles the annual report for internship programme, which details all the successes, challenges, transformation, and status of employment of the students.

RESEARCH AND PROGRAMME METHODOLOGY AND PROCESS

The methodology used in this research was mainly qualitative, with some quantitative aspects. Secondary data as well as the authors' database were used. Triangulation with observation outcomes ensured the closing of the research loop. The one-year workplace training programme is designed in line with the requirements of academic experiential learning for a National Diploma in Metallurgical Engineering that allow students to build upon the theoretical knowledge learnt during foundry technology course modules with practical experience. The main purpose of this is to prepare the students for the workplace by assisting them to make an explicit connection between theoretical knowledge and practical applications of the concepts in the real foundry world. During this period the students are allocated to industry mentors who assist in guiding and coaching them.

In addition, students are provided with learning support by the university, such as access to the laboratories and technical staff at the UJ-MCTS. The students are provided with logbooks, which contain their work plans and are used to provide evidence of developing competencies. This also allows students to reflect on their learning experience. The learning experience is developed in such a manner that it enhances the students' technical foundry and generic skills such as teamwork abilities, problem solving, and effective communication. On completion of the one-year practical, the foundry assesses the overall competency of the students and their suitability to be retained within the foundry.

The sample used in this research is composed of the full population of 96 students who embarked on the MCTS skills development programme.

After receiving the curriculum vitae (CVs) and academic credentials of the students, a screening process take place to check that the students that have applied meet the minimum requirements. The CVs of qualifying candidates are sent to various foundries to allow them to shortlist, interview, and select suitable students based on their requirements. After selecting the successful students, the foundries send back the recommendation for processing and appointment of the students. During this period the information on the successful students is captured on the UJ-MCTS database. The database include information such as personal information on the students, foundries, geographical location of the foundries, attached proof of university registration, and status of employment of the student after completing the programme.

FINDINGS AND DISCUSSION

Students Placement in the Workplace

Between 2009 and 2015 (7 years) a total of 96 students were placed in the foundry industry, with an average of 14 placements per year (Figure 2). The substantial decrease in the number of placements in 2015 is attributed to slow growth in the economy, which drastically affected the foundries' order books and resulted in short working time for some foundries.

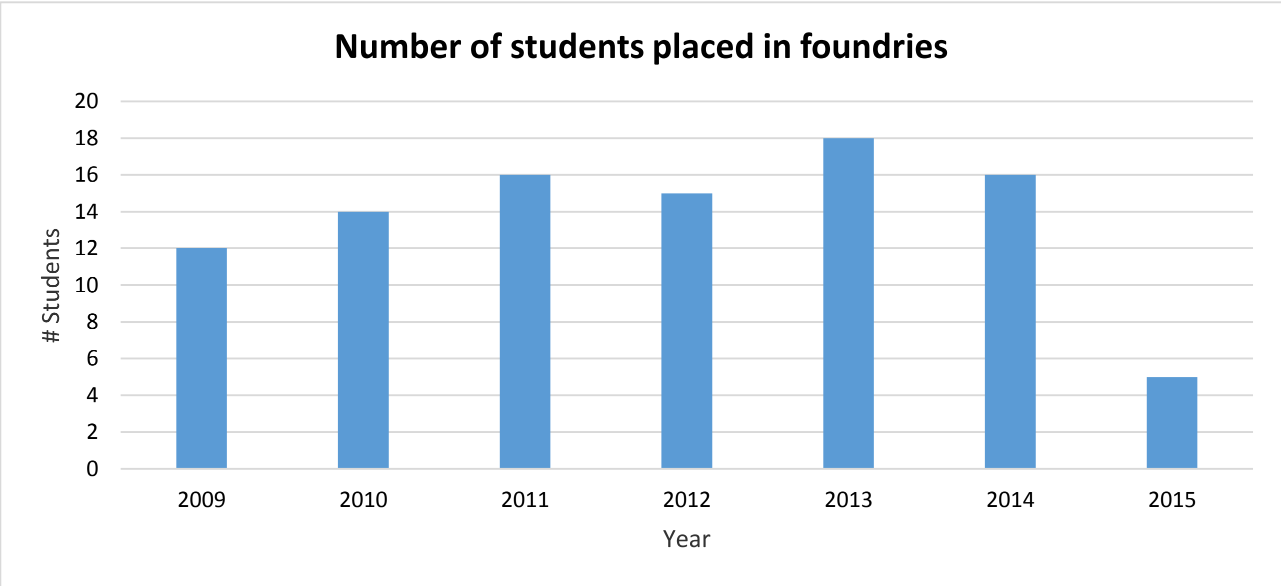

Figure 2. The number of students placed per financial year from 2009 to 2015.

In the process of placing the students, careful consideration was given to addressing issues related to racial and gender transformation for previously disadvantaged groups. Historically, the foundry industry has been a male-dominated field due to unfavourable working conditions characterized as the '3Ds', meaning, Dirty, Dusty, and Dangerous (Edwards, 2006). Despite this perception, the programme strove to balance the gender-related transformation issues and attract young talent into industry. Figure 3 shows that female students made up an overall 47% of the placements.

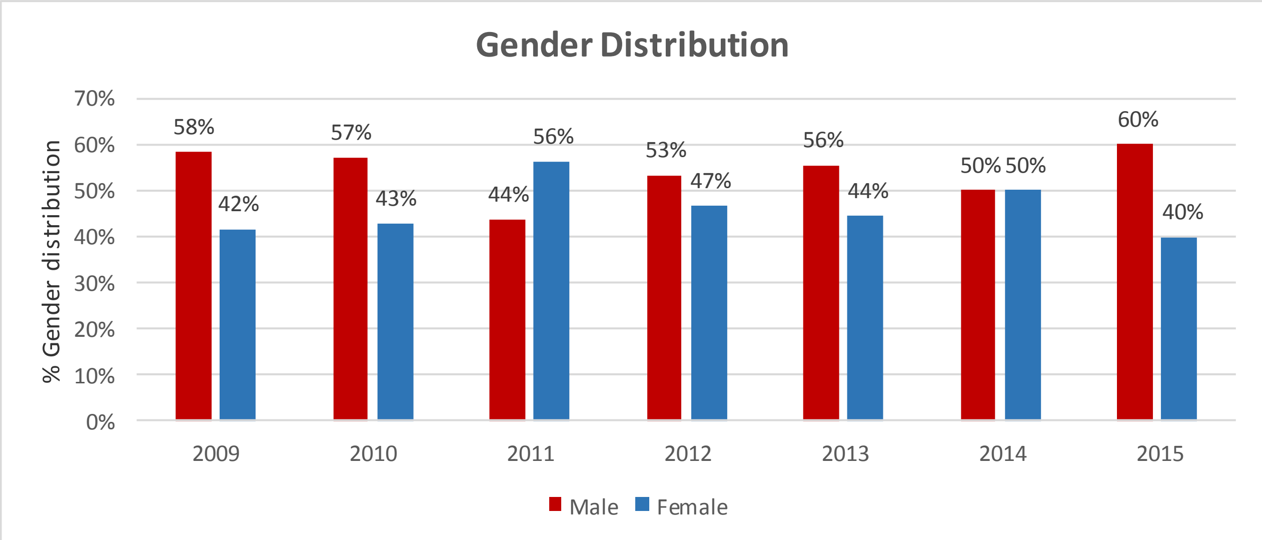

Figure 3. Gender distribution of students placed at the foundry industry from 2009-2015.

The work placement programme was designed to accommodate students from all provinces within the country into 170 ferrous and non-ferrous foundries in South Africa. However, the data shows that only 25% of the total available foundries in participated in the programme. The students were placed in various foundries in Gauteng, KwaZulu-Natal, and Western Cape., based on the willingness of individual foundries to participate in the programme.

As shown in Figure 4, Gauteng accounts for 60% of the placements, due to the large number of foundries (114 foundries) located in the province. KwaZulu-Natal and Western Cape, with fewer foundries, shared the remaining 40%. The foundry industry in South Africa emerged from the demand for cast parts from the mines, while there was less demand from industry activities in the coastal provinces. This would explain the above inequality.

To date the programme has not succeeded in placing students other province such as Mpumalanga, Northern Cape, and Eastern Cape, where there are very few foundries. However, foundries in these provinces are being contacted and visited in efforts to engage their participation in the programme.

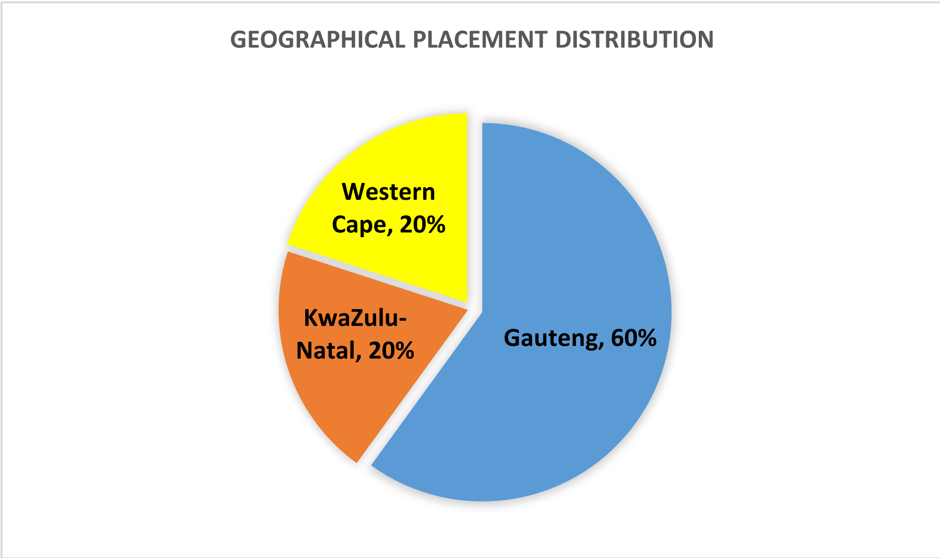

Figure 4. Geographical distribution of student placements by province.

Outcomes of the Workplace Training Programme

The success of the placement programme in enabling students to gain skills was assessed from the number of students retained by the foundries after completion of the programme. On average, 60% of the students were retained in the industry, either as temporary or permanent employees (Figure 5). This shows that the programme is contributing to job creation, as well as to professional growth and development of the students. It also contributes to growth, sustainability, and competitive advantage of those foundries employing the students.

We have observed that students who are employed for more than 5 years are more likely to be promoted to managerial positions. Of those that are not retained, some return to university to further their studies and increase their knowledge base in the metallurgy field, while others leverage their newly acquired workplace skills including self-organization, time management, and discipline at work to find opportunities in other fields of metallurgy.

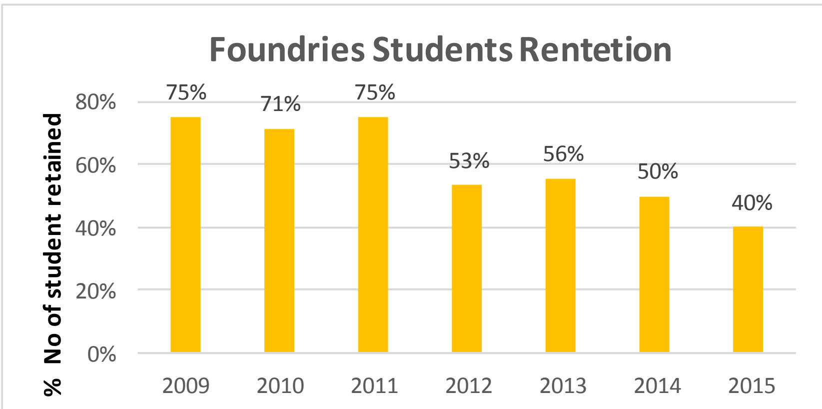

Figure 5. Retention of students after completing the programme.

CONCLUSION

The work placement programme has great potential to lead to employment of students, with an average of 60% being retained in industry after completing the programme. This boosts the number of university graduate in the foundry industry.

The study showed that the programme promotes gender transformation, in that 47% of the placements were taken by female students.

The study recorded a decrease in placement in 2015, which is attributed mainly to slow economic growth, resulting in foundries having low order books and reduced operational time.

Through the workplace placement programme the industry and students are in a win-win situation. It is concluded that the technical skills available for foundries can be increased when universities and industry collaborate to achieve common goals of skills development to unlock the competiveness of the foundry industry.

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Presenting Author's profile

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